

# The tropical eastern Pacific species of the Condyllocardiidae (Bivalvia)

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## ABSTRACT

There are at least ten minute species of Condyllocardiidae in the tropical eastern Pacific: eight species assigned to *Condyllocardia* and two to *Carditella*. Eight of these taxa are described here for the first time: *Condyllocardia sparsa* new species, *Condyllocardia fernandina* new species, *Condyllocardia koolsae* new species, *Condyllocardia elongata* new species, *Condyllocardia kaiseriae* new species, *Condyllocardia geigeri* new species, *Carditella galapagana* new species, and *Carditella mariceta* new species. Many of the new species seem to be endemic to islands.

## INTRODUCTION

The Condyllocardiidae is a group of minute marine bivalves that brood their young within their mantle cavity. E. Bernard (1897: 205) suggested that they derived by neoteny from the Carditidae; however, the family may be polyphyletic, with some currently included taxa derived from other groups. There also remain some significant unresolved questions about which genera constitute the Condyllocardiinae. For example, Chavan (1969: 549–550) placed *Carditella*, which has an external ligament as well as a central resilifer, in the Carditidae, but allocated *Carditopsis*, which has only a central resilifer, in the Condyllocardiidae (op. cit., p. 558); they are otherwise very similar. Probably only molecular evidence will resolve this and similar questions, because miniaturization may have occurred more than once in the Carditidae, which, at least in substantial part, are brooders.

The Condyllocardiidae is unexpectedly diverse, and in recent years many new species have been described, a significant number of them endemic to small geographic areas, particularly islands (Salas and Rolán, 1990; Salas and Cosel, 1991; Hayami and Kase, 1993; Middleffart, 2000, 2001, 2002a, b).

The purpose of the present study is to put on record the diversity of the Condyllocardiidae in the tropical eastern Pacific, where there are several undescribed species, based on material that has recently become available.

All the species discussed here are under 3.1 mm in length, with most under 2 mm. Consequently, light photography is difficult, and the illustrations here were prepared with scanning electron microscopes at the California Academy of Sciences, the University of Southern California, and the Natural History Museum of Los Angeles County.

In the following treatment, each valid taxon is followed by a synonymy, description, information on type specimens and type localities, notes on distribution and habitat, the etymology of the new species names, and an additional discussion. The synonymies include all major accounts about the species, but not minor mentions in the literature. The distributional information is based on Recent specimens I have examined, except as noted. The only fossil occurrence was taken from the literature. References are provided in the Literature Cited for all works and taxa mentioned.

## ABBREVIATIONS

The following abbreviations are used in the text: AM, Australian Museum, Sydney, Australia; CAS, California Academy of Sciences, San Francisco, California, USA; ICZN, International Commission on Zoological Nomenclature; INBio, Instituto Nacional de Biodiversidad, Santo Domingo, Heredia, Costa Rica; LACM, Natural History Museum of Los Angeles County, California, USA; PRI, Paleontological Research Institution, Ithaca, New York, USA; MNHN, Muséum National d'Histoire Naturelle, Paris, France; SBMNH, Santa Barbara Museum of Natural History, Santa Barbara, California, USA; UMMI, Marine Invertebrate Museum, Rosenstiel School of Marine and Atmospheric Sciences, Miami, Florida, USA; USNM, National Museum of Natural History, Smithsonian Institution, Washington, DC, USA; ZMC, Zoologisk Museum Copenhagen, Denmark. Material in the private collections of Carol C. Skoglund,

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Table 1. Some key characters of eastern Pacific Condyllocardiidae

	Shape	Radial/commarginal ribs	Prodissoconch	Hinge
<i>Condylocardia digueti</i>	narrow-trigonal	6–11 broad radials/commarginal bars	mucronate, with radial ribs, strongly demarcated	posterior lateral in LX low
<i>Condylocardia hippopus</i>	trapezoidal	7–8 radials, largest anteriorly/moderate commarginals	mucronate, with radial ribs, strongly demarcated	posterior lateral in LX large
<i>Condylocardia sparsa</i>	trapezoidal	4–5 broad radials; posterior slope unsculptured/commarginal striae	mucronate, with radial ribs, strongly demarcated	posterior lateral in LX large
<i>Condylocardia fernandina</i>	broad-trigonal	7–8 low radials/strong commarginals	mucronate, with radial ribs, strongly demarcated	posterior lateral in LX large
<i>Condylocardia koolsae</i>	ovate	15–16 radials/moderate commarginals	small, pointed, not set off	short posterior lateral in LX
<i>Condylocardia elongata</i>	elongate	9–10 radials, smallest medially/fine commarginals	pointed, not set off, tip indented	short posterior lateral in LX; each valve with large anterior cardinal
<i>Condylocardia kaiserae</i>	oblique-trapezoidal	13–14 radials, wider anteriorly/moderate commarginals	pointed, not set off, tip indented	posterior lateral in LX large
<i>Condylocardia grigori</i>	ovate-trigonal	18 broad radials/crossbars ventrally	mucronate, set off, pustulose	posterior larger in LX; small in most specimens, large in largest specimens
<i>Carditella galapagana</i>	trapezoidal	16 nodose radials/fine commarginals	pointed, not strongly demarcated, pustulose	posterior lateral in LX large; each valve with large anterior cardinal
<i>Carditella marieta</i>	trapezoidal	11 nodose radials/fine commarginals	small, strongly demarcated, with fine radial sculpture	posterior lateral in LX large; each valve with large anterior cardinal

Phoenix, Arizona, USA; and Kirstie L. Kaiser, Puerto Vallarta, Jalisco, Mexico, was also examined.

#### MORPHOLOGICAL CHARACTERS

Aside from the fundamental difference in hinge morphology between the *Condylocardia* and *Carditella*, a combination of shell shape, external sculpture, prodissoconch morphology, and aspects of the dentition suffice to differentiate the species; these are detailed in the descriptions and the most important of them summarized in Table 1. Differences in shell color are also noted in the descriptions of some taxa.

Some of the taxa discussed here are provisionally placed in *Condylocardia* and may eventually merit the description of additional genera (Middelfart, personal communication, December 2002), a task beyond the scope of the present treatment (see also Discussion at end).

#### SYSTEMATICS

Condyllocardiidae: F. Bernard, 1896

Condyllocardiinae: F. Bernard, 1896

*Condylocardia*: F. Bernard, 1896

*Condylocardia*: F. Bernard, 1896: 195, ex Mmmer-Chalmas ms. Type species (subsequent designation by F. Bernard, 1897: 175) as *C. puthana* nom. van. = *C. sametipauli* F.

Bernard, 1896: 196, ex Mmmer-Chalmas ms. Recent, Île St. Paul, Indian Ocean.

*Hippella* Mörech, 1861: 200, suppressed by ICZN (1969), Opinion 572. Type species (monotypy): *Hippella hippopus* Mörech, 1861: 200. Recent, tropical eastern Pacific.

*Radiocondyla* Iredale, 1936: 272. Type species (original designation): *R. arizela* Iredale, 1936: 272, = *C. rectangularis* Cotton, 1930: 237–238, figure 10. Recent, Australia

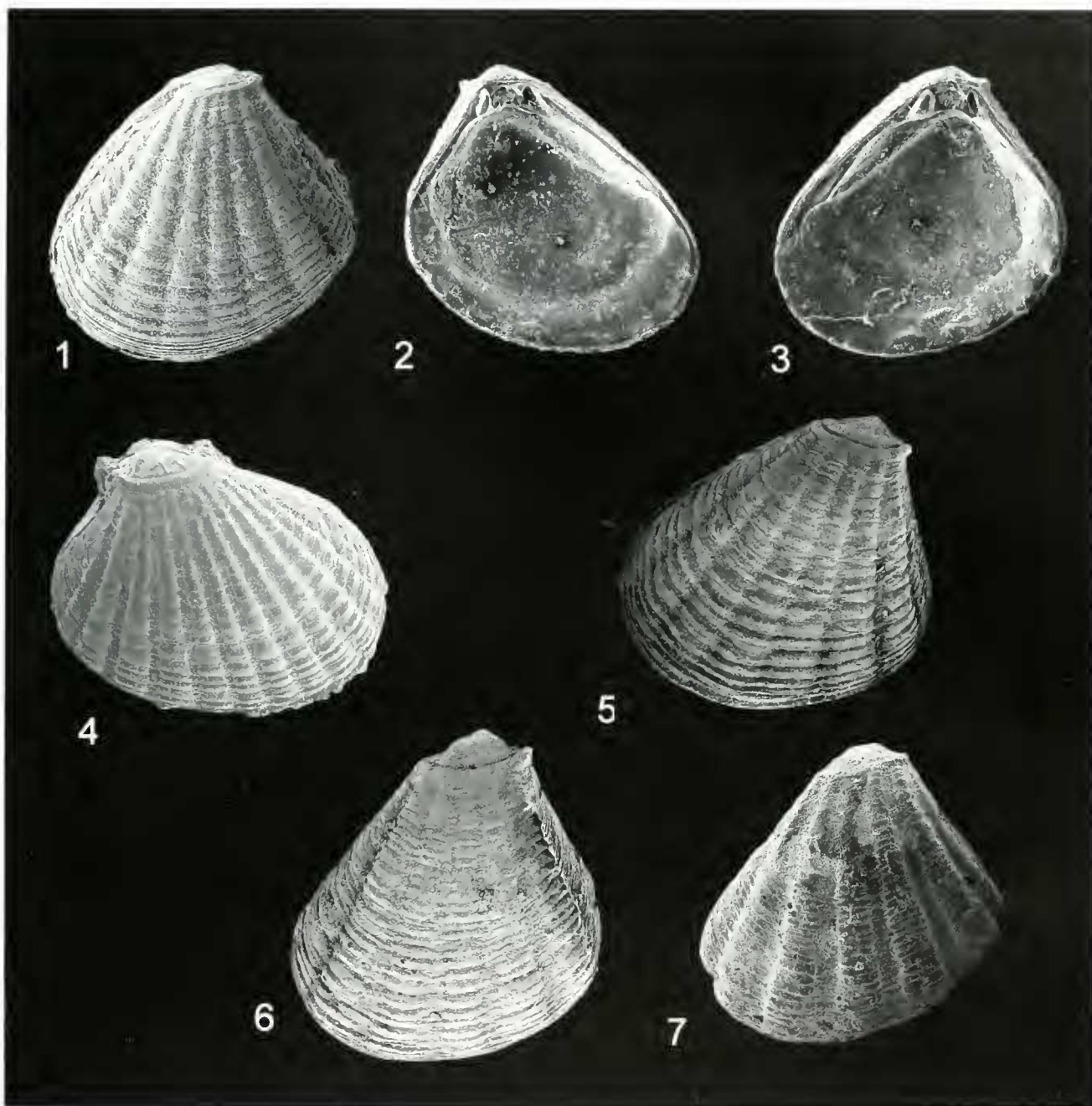
**Diagnosis:** Ligament in a central resilifer; no external ligament present. Prodissoconch bounded by a rim that is raised in most, and which has faint radial ribs in most. To 3.1 mm.

*Condylocardia digueti* Lamy, 1917

(Figures 1–7)

*Condylocardia digueti* Lamy, 1917: 443–445, figs. 1–3; 1922: 367–368, figs. 1–3; Hertlein and Strong, 1948: 106, Keen, 1958: 86–87, fig. 170, 1971: 110–111, fig. 245, Kaiser and Bryce, 2001: 15, pl. 7, fig. 1–1b.

**Description:** Shell narrow-trigonal, longer anteriorly; anterior end rounded to slightly pointed; posterior end rounded. Prodissoconch large, set off by raised rim, mucronate, with fine radial ribs. Lunule and esentelchon broad. Shell with 6–11 broad radial ribs with narrow interspaces; radial ribs crossed by commarginal bars. Pos-



**Figures 1-7.** *Condylocardia digueti* 1-3. External view of left valve, internal views of left and right valves, Bahía Magdalena, Pacific coast of Baja California Sur, Mexico, 1-11 m, LACM 71-1S3.43, lengths = 1.6 mm. 4. External view of right valve, Bahía Pulmo, Baja California Sur, Mexico, 6 m, LACM 66-20.1, length = 1.5 mm. 5. External view of left valve, Isla Santa Margarita, Pacific coast of Baja California Sur, 0-2 m, LACM 66-S.24, length = 1.5 mm. 6. External view of left valve, Punta Ancón, Guayas, Ecuador, intertidal zone, LACM 70-12.40, length = 1.2 mm. 7. Bahía San Gabriel, Isla Espíritu Santo, Baja California Sur, Mexico, syntype, MNHN, left valve, length = 1.5 mm.

terior-most portion of posterior slope with commarginal bars only. White to light tan or yellow. Right valve with large anterior cardinal and small, dorsally positioned posterior cardinal, the resilifer between them; elongate anterior lateral on submarginal ridge, separated from shell margin by serrate groove for anterior margin of left

valve; posterior margin serrate, slightly raised distally into lateral tooth. Left valve with small, dorsally positioned anterior cardinal and large posterior cardinal, the resilifer between them; pit anterior to anterior cardinal for anterior cardinal of right valve; anterior margin with serrate lateral ridge, raised distally into low lateral tooth;

posterior margin with low lateral tooth on submarginal ridge separated by serrate groove for posterior margin of right valve. Length to 1.6 mm. Two specimens from Bahía Magdalena (LACM 71-153.43) (Figures 1-3), one specimen each from Bahía Pulmo (LACM 66-20.1) (Figure 4) and Isla Santa Margarita (LACM 66-8.24) (Fig. 5), both Baja California Sur, Mexico, and one specimen from Punta Ancón, Guayas, Ecuador (LACM 70-12.40) (Fig. 6), are figured here to show the range in shapes of this species.

**Type Material:** MNHN (no number), syntypes, 3 closed pairs, 2 right valves, 2 left valves, M. L. Dignet, 1914, from type locality. The largest left valve measures: length, 1.5 mm; height, 1.5 mm (Figure 7).

**Type Locality:** Bahía San Gabriel, Isla Espíritu Santo, Baja California Sur, Mexico (24.4° N, 110.4° W).

**Distribution:** NE end of Isla Cedros, Pacific coast of Baja California, 25.3° N [LACM 71-151.49, 71-152.31], into the Golfo de California as far N as Punta la Gringa, Bahía de Los Angeles, Baja California, 29.1° N [LACM 56-195.4], and Cabo Haro, Guaymas, Sonora, 27.8° N [CAS 159733], Mexico, to SE side of Punta Ancón, Península de Santa Elena, Ecuador, 2.3° S [LACM 70-12.40; SBMNH 3-15057]; Isla de Malpelo, Colombia (Kaiser Collection); Isla San Cristóbal, 0.9° N [LACM 34-267.2, 34-269.9, 35-188.3] and Isla Santa María, 1.3° N [LACM 34-297.3], Islas Galápagos, Ecuador; intertidal zone to 97 m (mean = 19.1 m; n = 57), in rubble. Lots examined: 91.

**Discussion:** The species is by far the most abundant and widespread in the eastern Pacific and exhibits considerable variability in shape and number of ribs. Most specimens, such as the figured syntype, are almost triangular, whereas others are more rounded, such as the specimen from Bahía Pulmo figured here. Available material fully bridges these extremes.

*Condylocardia hippopus* Mörch, 1861  
(Figures 8-11)

*Hippella hippopus* Mörch, 1861: 200, Keen, 1958: 57; 1966: 6, S, fig. 1; 1971: 110-111, fig. 246 [*Condylocardia*].

*Condylocardia panamensis* Olsson, 1942: 186-187 [issue pagination = 34-35, 240] = 55, pl. 37 [ = 3], figs. 9, 10, Hertler and Strong, 1945: 106, Olsson, 1961: 190-191, 550, pl. 77, fig. 4, Keen, 1966: S, 1971: 110 [as a synonym of *C. hippopus*] PRI 1090, holotype, left valve; length, 1.75 mm, PRI 1091, paratypes (neither lot examined). Zone of unconformity at base of Pleistocene; Punta de Piedra, Península de Barro Colorado, Chiriquí Province, Panamá (S 2° N, S 29° W).

**Description:** Shell trapezoidal, longer posteriorly; anterior end sharply rounded, posterior end narrow, pointed. Prodissoconch large, set off by raised rim, mucronate, with final radial ribs. Lamellae narrow, shallow; esutcheon broad, concave. Shell with 7-8 radial ribs, larger and with wider interspaces posteriorly, and often with

smaller radial rib posterior to these; posterior-most portion posterior slope without radial ribs. Radial ribs crossed by moderate commarginal ribs, forming bars on surfaces of radial ribs. White, sometimes with brown patches. Right valve with large anterior cardinal and small, dorsally positioned posterior cardinal, the resilifer between them; anterior end with large lateral tooth on submarginal ridge separated by serrate groove for margin of right valve; posterodorsal margin serrate, swollen into low lateral tooth distally, with small submarginal shelf below it. Left valve with small, dorsally positioned anterior cardinal and large anterior cardinal, the resilifer between them; anterior to anterior cardinal is pit for anterior cardinal of right valve; anterodorsal margin serrate, slightly raised distally into lateral tooth, with small submarginal shelf below it; posterior end with lateral on small submarginal ridge separated from hinge margin by serrate groove for hinge margin of right valve. Length to 2.4 mm (LACM 72-42.60; Bahía Ballena, Puntarenas Province, Costa Rica). Two specimens from Bahía Potrero, Guanacaste Province, Costa Rica (LACM 72-35.25), are figured here (Figures 5-10).

**Type Material:** UZM no number, syntypes, one closed pair, one broken left valve, one intact left valve, one unusually thickened right valve, A. S. Oersted, 1848, from type locality, "in Margaritiferis" [text], "in Balan" [label]. The intact left valve is figured here, length 2.0 mm; height 1.9 mm (Figure 11). An external view of the right valve of the pair was given by Keen (1966: 7, figure 4).

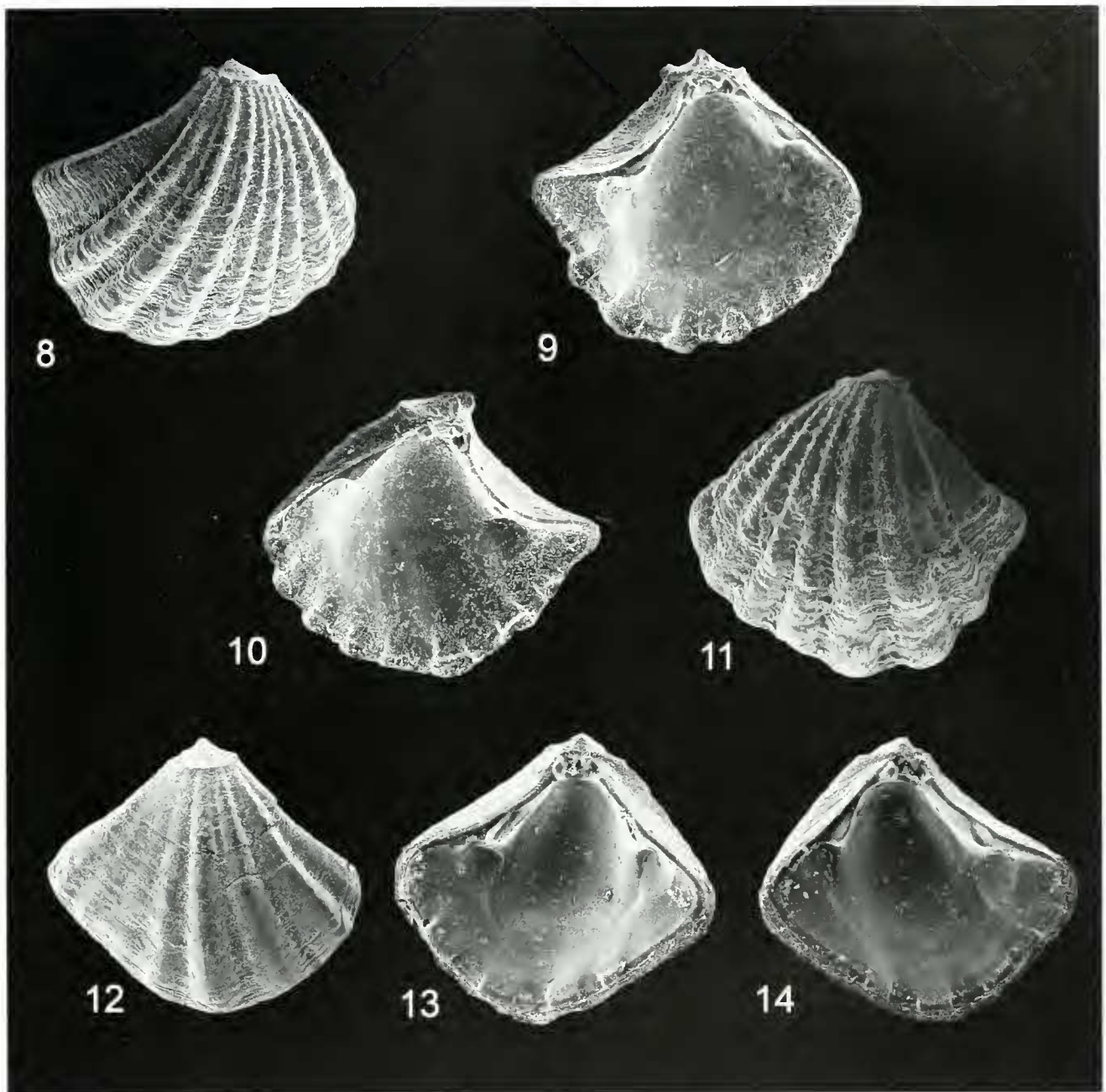
**Type Locality:** Puntarenas, Puntarenas Province, Costa Rica, 10.0° N, 84.9° W.

**Distribution:** Bahía Jobo, Guanacaste Province, 11.1° N [LACM 72-17.43], to Isla del Caño, Puntarenas Province, 8.3° N [LACM 72-63.78], Costa Rica; Búcaro, Los Santos Province, Panamá, 7.4° N (Olsson, 1961; specimens not located in UMMIL (S. Voss, personal communication, 18 September 2001); Isla Taboga, Panamá Province, 8.8° N [LACM 39-262.1], Panamá; Isla Marchena, Islas Galápagos, Ecuador, 0.3° N [LACM 34-285.7]; 3-99 m (mean = 23.7 m; n = 24), in rubble. Lots examined: 25.

*Condylocardia sparsa* new species  
(Figures 12-14)

**Description:** Shell trapezoidal, longer posteriorly, inflated, anterior end produced, pointed; posterior end pointed. Prodissoconch large, set off by raised rim, mucronate, with fine radial ribs. Lamellae broad, concave; esutcheon broad, less concave. Shell with 1-5 broad radial ribs on the anterior and central slopes; interspaces of approximately half-rib width; posterior slope with only faint traces of radial ribs; ribs crossed by commarginal growth striae. Beaks and anterior slope brown, but shell entirely brown in some specimens. Right valve with moderate anterior cardinal and tiny, dorsally positioned posterior cardinal, the resilifer between them; posterior



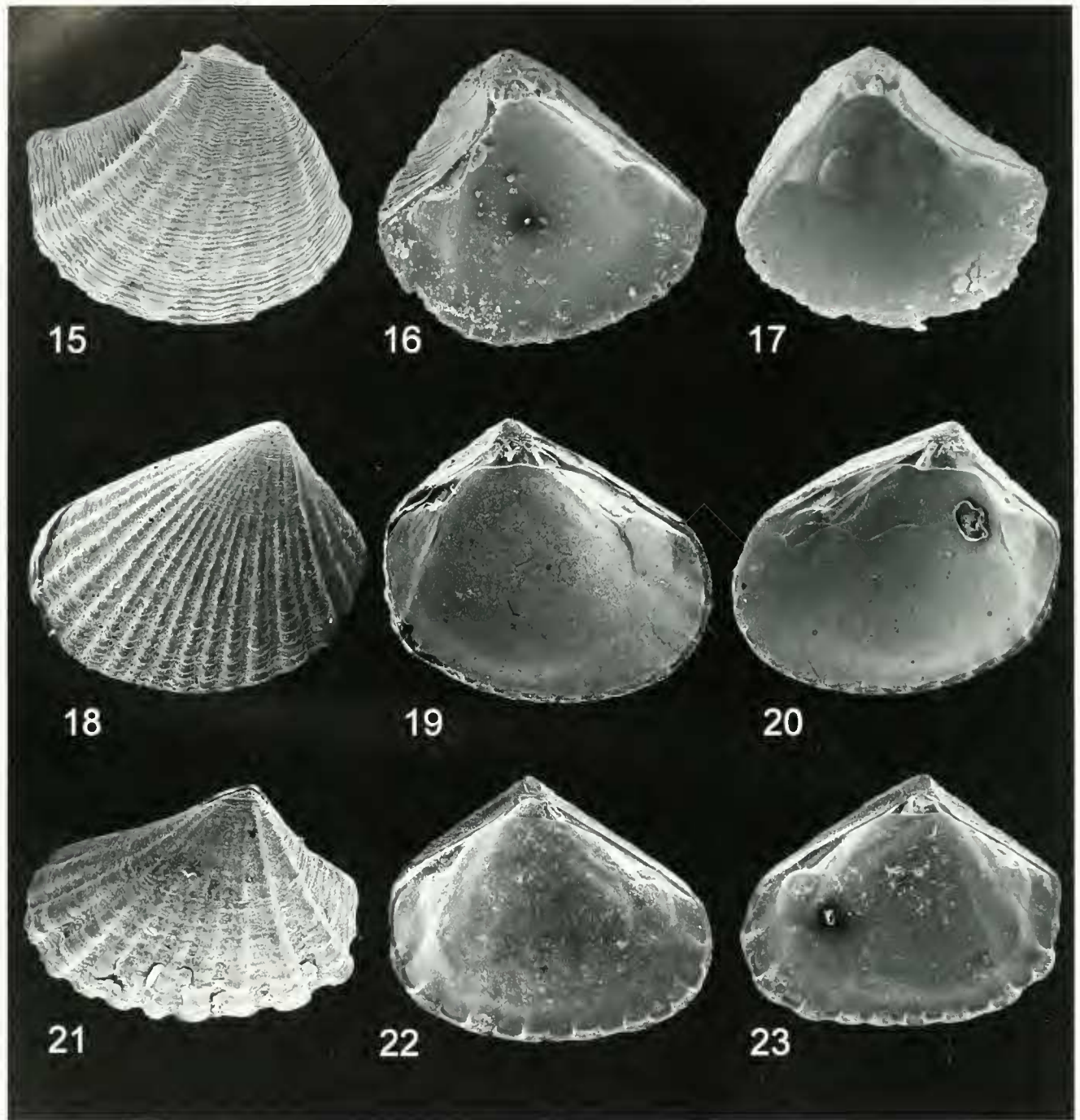


Figures 8–14. *Condylocardia* species. 8–11. *Condylocardia hippopnis*. 8–10. External view of right valve, internal views of left and right valves. Bahía Potrero, Guanacaste Province, Costa Rica, 5–12 m, LACM 72-35.28, lengths = 1.5 mm. 11. Puntarenas, Puntarenas Province, Costa Rica, syntype, UZM left valve, length = 2.0 mm. 12–14. *Condylocardia sparsa* new species, paratypes, external view of right valve, internal views of left and right valves. Bahía Potrero, Guanacaste Province, Costa Rica, 5–12 m, LACM 2919, locality 72-35, lengths = 1.9 mm (external view), 1.7 mm (internal views).

to posterior cardinal is pit for posterior cardinal of left valve; anterior end with elongate lateral on submarginal ridge separated from hinge margin by serrate groove for margin of left valve; posterodorsal margin raised into lateral tooth distally, with very short submarginal shelf directly below it. Left valve with tiny, dorsally positioned anterior cardinal and moderate posterior cardinal, the resilifer between them; anterior to anterior cardinal is

pit for anterior cardinal of right valve; anterior end with lateral tooth on hinge margin and very short submarginal shelf directly below it; posterior end with large lateral on submarginal ridge separated from hinge margin by serrate groove for margin of right valve. Length to 2.2 mm (LACM 50-60.16).

**Type Material:** LACM 2918, holotype, pair; length.



Figures 15–23. *Condylocardia* species. 15–17. *Condylocardia fernandina* new species, paratypes, external view of right valve, internal views of left and right valves, Isla Marchena, Islas Galápagos, Ecuador, 12 m, LACM 2921, locality 66-125, lengths = 1.9 mm (external view), 1.7 mm (internal views). 18–20. *Condylocardia koolsae* new species, paratypes, external view of left valve, internal views of left and right valves, Isla Wolf, Islas Galápagos, Ecuador, 274 m, LACM 2925, locality 31-264, lengths = 2.0 mm. 21–23. *Condylocardia elongata* new species, paratypes, external view of left valve, internal views of left and right valves, Isla Fernandina, Islas Galápagos, Ecuador, 15–30 m, LACM 2927, locality LACM 72-196, lengths = 1.9 mm (external view), 2.0 (internal views).

1.9 mm; height 1.7 mm; LACM 2919, paratypes, 10 pairs, 15 valves, ST ARCHER station 126, Pat LaFollette and Don Cadieu, 20 February 1972, from type locality. Two paratypes are figured here (Figures 12–14).

**Type Locality:** Punta Peña, N of Bahía Potrero, Guanacaste Province, Costa Rica, 10°29'15" N, 85°15'S5" W, LACM locality 72-38; S-12 m; ST ARCHER station 126.



**Distribution:** Isla Meanguera, El Salvador, 13.2° N, to Punta Quepos, Costa Rica, 9.4° N; intertidal zone to 35 m (mean = 12.1 m; n = 11).

**Other Material Examined:** El Salvador: Kaiser Collection and LACM 2001-15.1, Isla Meanguera, La Unión Province, El Salvador, 13.2° N, 1 m, 3 pairs, 5 valves; Kaiser Collection, Isla Meanguera, La Unión Province, El Salvador, 13.2° N, 5 m, 17 pairs, 5 valves; Kaiser Collection and SBMNH 346013, Isla Meanguera, La Unión Province, El Salvador (13.2° N), 12 m, 53 pairs, 32 valves; Nicaragua: LACM 74-56.12, El Velero, Leon Province, Nicaragua, 12.0° N, 2 m, 3 beachworn valves; Costa Rica: LACM 80-60.16, Cabo Santa Elena, Puntarenas Province, Costa Rica, 10.8° N, intertidal zone, 1 pair; Type lot, near Bahía Potrero, Guanacaste Province, Costa Rica, 10.5° N, LACM locality 72-38, 5–12 m; INBio 0003404072, Cabo Blanco, Puntarenas Province, Costa Rica, 9.6° N, 20–50 m, 1 pair, 4 valves; INBio 0001494861, Punta El Flor, near Cabo Blanco, Puntarenas Province, Costa Rica, 9.6° N, 14 m, 1 pair, 2 valves; SBMNH 348055, Bahía Ballena, Puntarenas Province, Costa Rica, 9.7° N, 12–14 m; LACM 72-58.58, Punta Quepos, Puntarenas Province, Costa Rica, 9.4° N, 9–23 m, 12 pairs, 1 valve (plus one pair now in AM C.403166); LACM 72-59.29, Punta Quepos, Puntarenas Province, Costa Rica, 9.4° N, 23 m, 1 pair.

**Etymology:** The specific name refers to the few radial ribs on this species.

**Discussion:** This species is most similar to the sympatric *C. hippopus*, differing in being more trapezoidal, more inflated, and with relatively unsculptured posterior slope. *Condylocardia sparsa* also has fewer radial ribs, which are crossed by commarginal striae rather than ribs.

*Condylocardia fernandina* new species  
(Figures 15–17)

**Description:** Shell broad-trigonal, subequilateral; anterior end pointed; posterior end sharply rounded. Prodissoconch large, set off by raised rim, mucronate, with fine radial ribs. Lamule broad, concave; esutcheon broad, flat. Shell with 7–8 low, broad radial ribs, often with small radial rib anterior to these; interspaces narrow, the anterior-most wider; ribs crossed by dense, moderately strong commarginal ribs; shell white to brown. Right valve with moderate anterior cardinal and very small, dorsally positioned posterior cardinal, the resilifer between them; posterior to posterior cardinal is pit for posterior cardinal of left valve; anterior end with lateral on submarginal ridge separated from shell margin by serrate groove for margin of left valve; posterior margin serrate, elevated distally into lateral tooth, with short submarginal shelf directly below it. Left valve with tiny, dorsally positioned anterior cardinal and moderate posterior cardinal, the resilifer between them; anterior to anterior cardinal is pit for anterior cardinal of right valve; anterior margin serrate, raised distally into lateral tooth,

with short submarginal shelf directly below it; posterior margin with strong lateral on submarginal ridge, separated from shell margin by serrate groove for posterior margin of right valve. Length to 2.1 mm.

**Type Material:** LACM 2920, holotype, pair, length 1.9 mm, height 1.5 mm; LACM 2921, paratypes, 7 pairs, 14 valves; AM C.403167, paratype, left valve, James H. McLean, 11 May 1984, from type locality. Two paratypes are figured here (Figures 15–17).

**Type Locality:** Punta Espejo, E side of Isla Marchena, Islas Galápagos, Ecuador 0°19.5' N; 90°24' W. LACM locality 84-26, 12 m, rock and coarse sand.

**Distribution:** Islas Galápagos, Ecuador, from 1.4° N to 1.4° S; not counting the uncertain lot from Isla Wolf, 0–110 m (mean = 33.1 m; n = 5).

**Other Material Examined:** Restricted to the Islas Galápagos, Ecuador: LACM 34-264.6, Isla Wolf, 1.4° N, 274 m, 1 pair [specimen tentatively assigned to this species]; LACM 84-39.33, S anchorage, Isla Santa Cruz, 0.6° N, intertidal zone, rocks and sand, 1 pair; LACM 84-41.19, S side of Isla Santa Cruz, 0.5° N; 15–24 m, rocky slope, 3 valves; LACM 84-26.16, type lot, Isla Marchena, 0.3° N, 12 m; LACM 66-125.34, N of Punta Espinosa, Isla Fernandina, 0.3° S, 0–3 m, 1 pair; CAS 42344, Bahía Conway, Isla Santa Cruz, 0.5° S, depth not recorded, 12 pairs, 17 valves; LACM 34-287.7, Bahía Academy, Isla Santa Cruz, 0.8° S, 27 m, 7 valves; LACM 34-267.3, Bahía Wreck, Isla San Cristóbal, 0.9° S, 40 m, 1 pair; LACM 33-161.2, Hancock Bank, NE of Isla Santa María, 1.0° S, 110 m, 1 valve; LACM 34-283.10, Isla Española, 1.4° S, 55 m, 1 pair, 7 valves.

**Etymology:** The specific name is taken from Isla Fernandina, Islas Galápagos, where the species was first noted.

**Discussion:** The lot from Isla Wolf consists of a single, worn pair that is thinner, broader, and flatter than the rest of the referred material. Of eastern Pacific species, *Condylocardia fernandina* is most similar to *C. digueti*, differing from it in attaining a larger size, in being nearly equilateral, broader, with more pointed ends. The sculpture is similar but heavier, the radial ribs being more raised. The commarginal sculpture is much finer and denser. The prodissoconch is more mucronate. Of western Atlantic species, it is most similar to *C. smithi* (Dall, 1896: 16–17, pl. 1, figure 4, as *Carditella*), described from Bermuda, in having a trigonal shape and dense, lamellar sculpture, but it differs in being larger and in having fewer, more prominent ribs (based on examination of USNM 762566 from Bermuda).

*Condylocardia koolsae* new species  
(Figures 18–20)

**Description:** Shell ovate, longer anteriorly; anterior end rounded; posterior end subtruncate, sharply rounded posterodorsally. Lamule elongate; esutcheon broad. Prodissoconch small, pointed, set off by an inconspicuous

ous rim. Sculpture of 15–16 radial ribs, broadest just anterior to posterior slope; interspaces widest towards ends; with moderate commarginal ribs, forming knobs on radial ribs; posterior-most portion of posterior slope with commarginal striae only. White. Right valve with elongate anterior cardinal and minute, dorsally positioned posterior cardinal, the resilifer between them; anterior lateral on submarginal ridge separated by groove for lateral of left valve; posterior margin slightly elevated into lateral tooth distally, with short submarginal shell below it. Left valve with elongate anterior cardinal, fitting above that of right valve, and minute, dorsally positioned posterior cardinal, the resilifer between them; anterior shell margin slightly elevated distally into lateral tooth, short submarginal shell below it; short posterior lateral present on submarginal ridge separated from shell margin by groove for margin of right valve. Length to 2.2 mm.

**Type Material:** LACM 2924, holotype, pair; length, 2.2 mm; height, 1.9 mm. LACM 2925, paratypes, 5 pairs, 11 valves; AM C.103169, paratype, right valve. VERTERO III, Alan Hancock Foundation station BS 430, 11 January 1934, all from type locality. Two of the LACM paratypes are figured here (Figures 18–20).

**Type Locality:** Isla Wolf, Islas Galápagos, Ecuador, 1°23' N, 91°49' W; Alan Hancock Foundation station BS 430, LACM locality 34-264, 274 m, mud. This is the same station as the type locality of *Carditella galapagana*.

**Distribution:** Known only from Isla Wolf, Islas Galápagos, Ecuador, 1.4° N; 183–274 m (mean = 228.5 m; n = 2).

**Other Material Examined:** Type lot, Isla Wolf, Islas Galápagos, Ecuador, 1.4° N, LACM locality 34-264, 274 m; LACM 34-263.7, same locality, 183 m, 3 pairs, 3 valves.

**Etymology:** This species is named after Elizabeth Kools of the California Academy of Sciences, who has helped on this and many other projects.

**Discussion:** In this species and *C. elongata*, unlike in other eastern Pacific species of *Condylocardia*, the larger tooth in the left valve is the anterior one, which fits above the anterior cardinal of the right valve.

#### *Condylocardia elongata* new species

(Figures 21–23)

**Description:** Shell elongate, longer anteriorly; anterior end rounded; posterior end truncate. Prodissoconch small, pointed, unsculptured, set off by an inconspicuous rim, tip indented. Lamellae elongate, of moderate width; esutcheon broad, slightly concave. Sculpture of 9–10 strong radial ribs on anterior and central slopes; ribs with narrower interspaces medially; radial ribs crossed by fine commarginal striae, but with nodes on posterior-most radial rib. Posterior-most portion of posterior end with

commarginal striae only. White to light tan. Right valve with narrow anterior cardinal and minute, dorsally positioned posterior cardinal, the resilifer between them; anterior end with triangular lateral on submarginal ridge separated from shell margin by serrate groove for anterior margin of left valve; posterodorsal margin elevated into low lateral tooth. Left valve with narrow anterior cardinal, fitting above that of the right valve, and minute, dorsally positioned posterior cardinal, the resilifer between them; anterior end serrate, with low lateral tooth on hinge margin, and tiny submarginal ridge; posterodorsal margin with lateral tooth on submarginal ridge separated from hinge margin by groove for posterior lateral of right valve. Length to 2.4 mm (a paratype).

**Type Material:** LACM 2926, holotype, pair; length, 2.0 mm; height, 1.6 mm. LACM 2927, paratypes, 5 pairs, 21 valves, SEARCHER station 331, 25 January 1972. Two paratypes are figured here (Figures 21–23).

**Type Locality:** Punta Espinosa, Isla Fernandina, Islas Galápagos, Ecuador, 0°16'5" S, 91°26'20" W; LACM locality 72-196, SEARCHER station 331, 15–30 m.

**Distribution:** Islas Galápagos, Ecuador, from 1.4° N to 1.3° S, with a possible specimen from Isla La Plata, Ecuador.

**Other Material Examined:** All from the Islas Galápagos, Ecuador, except the last: LACM 34-264.5, Isla Wolf, 1.4° N, 274 m, 1 valve; LACM 34-263.8, same locality, 183 m, 2 valves; LACM 54-41.20, S side of Isla Pinta, 0.5° N, 15–24 m, 1 pair, 11 valves; LACM 54-26.17, Punta Espejo, E side of Isla Marchena, 0.3° N, 12 m, 6 pairs, 10 valves; LACM 33-17.1.9, Bahía Darwin, Isla Genovesa, 0.3° N, 31 m, 1 pair, 37 valves; LACM 34-262.2, Punta Albemarle, Isla Isabela, 0.2° S, 31 m, 1 pair; Type lot, Punta Espinosa, Isla Fernandina, 0.3° S, LACM locality 72-196, 15–30 m; LACM 34-271.9, Bahía Sullivan, Isla San Salvador, 0.3° S, 37 m, 3 valves; LACM 34-257.5, Bahía Academy, Isla Santa Cruz, 0.8° S, 27 m, 7 valves; LACM 35-193.15, same locality, 0.8° S, 18–37 m, 4 valves; LACM 33-157.7, Bahía Post Office, Isla Santa María, 1.3° S, 16 m, 1 valve; LACM 34-253.11, Isla Española, 1.1° S, 55 m, 2 pairs, 10 valves; SBMNH 348089, Isla la Plata, Manabí Province, Ecuador, 1.3° S, 12–30 m, 1 valve [specimen tentatively assigned to this species] Thus, 12–274 m (mean = 58.2 m; n = 13). Lots examined: 13.

**Etymology:** The specific name refers to the fact that this species is unusually elongate for the genus.

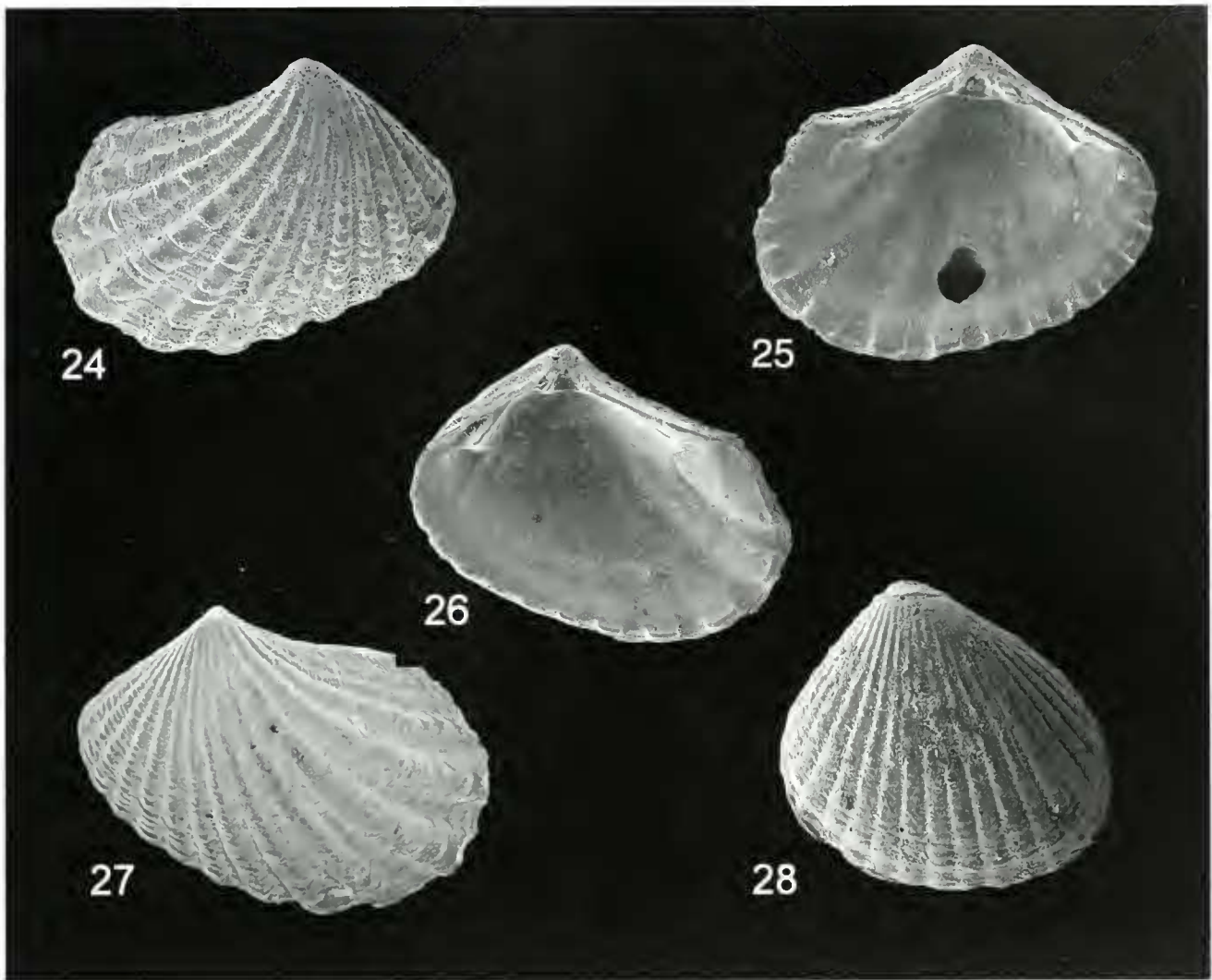
**Discussion:** *Condylocardia elongata* and *C. koolsae* are unique among eastern Pacific species of *Condylocardia* in that the larger cardinal tooth in the left valve is the anterior one.

#### *Condylocardia kaiserae* new species

(Figures 24–27)

*Condylocardia* sp. 1 — Kaiser and Bryce, 2001: 15, pl. 7, figures 2–2a, 2b





**Figures 24–28.** *Combylocardia* species. 24–27, *Combylocardia kaiserae* new species, paratypes, 24–26. External view of right valve, internal views of left and right valves, Isla Marchena, Islas Galápagos, Ecuador, 12 m, LACM 2929 (locality S4-26, lengths = 2.4 mm (external view), 2.1 mm (internal views)) 27. External view of left valve, “Tiger Mount” Isla de Malpelo, Colombia, 41–44 m, SBMNH 346012, length = 2.2 mm 28. *Combylocardia geigeri* new species, paratype, external view of right valve, Isla Santa Cruz, Islas Galápagos, Ecuador, 15 m, LACM 2964 (locality 34-286, length = 1.3 mm).

**Description:** Shell oblique-trapezoidal, much longer posteriorly; anterior end sharply rounded; posterior end broadly rounded. Prodissoconch large, pointed, mucronate, demarcated by rim, with fine radial ribs; tip indented. Lunule narrow; esutcheon broad, slightly concave. Sculpture of 11–14 radial ribs, widest posterior to midline with wider interspaces, becoming narrower anteriorly, but also with 1–2 narrow posterior ribs; posterior-most part of posterior slope with commarginal ribs only. Radial ribs crossed by moderate commarginal ribs, forming nodes on radial ribs, slightly scabrose in some specimens. White to light tan; posterior slope with brown patches in some specimens. Right valve with large anterior cardinal and minute, dorsally placed posterior cardinal, the resilifer between them; anterodorsal margin with lateral tooth on submarginal ridge, separat-

ed from shell margin by groove for shell margin of left valve; posterior margin raised into slightly serrate lateral tooth distally. Left valve with minute, dorsally positioned anterior cardinal and large posterior cardinal, the resilifer between them; anterior margin raised distally into low, serrate lateral tooth, with narrow submarginal shelf for margin of right valve directly below it; posterior end with large lateral on submarginal ridge, separated from hinge margin by groove for margin of right valve. Length to 3.1 mm (Isla Darwin, Islas Galápagos, LACM S4-29,23).

**Type Material:** LACM 2925, holotype, pair; length, 2.2 mm; height, 1.7 mm. LACM 2929, paratypes, 21 pairs, 7 valves; AM C.403173, paratypes, 1 right valve, 1 left valve. James H. McLean, 11 May 1954. Two para-

types are figured here (Figures 24–26). SBMNH 346012, paratype; length, 2.2 mm (Figure 27) ["Tiger Mount", Isla de Malpelo, Colombia, 1.0° N, 51.6° W; 41–44 m; Kirstie L. Kaiser; 11 March 2000].

**Type Locality:** Punta Espejo, E side of Isla Marchena, Islas Galápagos, Ecuador, 0°19.5' N, 20°24' W, LACM locality S4-26, 12 m, rock and coarse sand.

**Distribution:** Isla de Malpelo, Colombia, 1.0° N, and Islas Galápagos, Ecuador, as far south as 1.4° S; 12–274 m (mean = 77.4 m; n = 16).

**Other Material Examined:** Material from Isla de Malpelo, Colombia: Kaiser Collection, "Tiger Mount", 1.0° N, 9–15 m, 52 pairs, 15 valves; Kaiser Collection and LACM 2000-150.1, "Tiger Mount", 4.0° N, 24–34 m, 56 pairs, 10 valves; Kaiser Collection, "Tiger Mount", 4.0° N, 30–56 m, 12 pairs, 16 valves; Kaiser Collection and SBMNH 346012, "Tiger Mount", 4.0° N, 41–44 m, 2 pairs, including the paratype cited above. Material from the Islas Galápagos, Ecuador: LACM S4.29.23, N side of Arch Rock, SE end of Isla Darwin, 1.6° N, 6–9 m, boulders, coral and *Caulerpa*, 2 pairs, 6 valves; LACM 34-263.5, Isla Wolf, 1.4° N, 153 m, 1 pair, 9 valves; LACM 34-264.9, Isla Wolf, 1.4° N, 274 m, 1 pair, 5 valves; LACM S4-33.15, W anchorage, Isla Wolf, 1.4° N, 9–23 m, rocky slope, 1 valve; LACM S4-25.22, Beyond SW anchorage, Isla Wolf, 1.4° N, 23–30 m, sand, 1 pair, 6 valves, LACM S4-26.15; Type locality, Isla Marchena, 0.3° N, LACM locality S4-26, 12 m; LACM 34-43.23, Bahía Stephens, Isla San Cristóbal, 0.5° S, 59 m, 2 valves; LACM 33-161.3, Hancock Bank, Isla Santa María, 1.1° S, 110 m, 1 valve; LACM 34-250.5, Bahía Post Office, Isla Santa María, 1.3° S, 16 m, 1 valve; LACM 34-251.5, same locality, 1.2° S, 119 m, 7 valves; LACM 34-252.11, Bahía Gardner, Isla Española, 1.1° S, 64 m, 9 valves; LACM 34-253.9, Isla Española, 1.4° S, 55 m, 2 pairs, 3 valves.

**Etymology:** This species is named for Kirstie L. Kaiser, who has specialized on tropical eastern Pacific island faunas and encountered the first specimens of this species at Isla de Malpelo, Colombia.

**Discussion:** It is possible to confuse this species with very small specimens of the lucinid genus *Ctena*. The latter are longer anteriorly, have somewhat sunken ligament posteriorly and no central resilifer, two strong cardinal teeth in each valve, subequal anterior and posterior lateral teeth in the left valve, and a bulbous prodissoconch.

*Condylocardia geigeri* new species

(Figure 25)

**Description:** Shell ovate-trigonal, longer anteriorly; anterior end rounded; posterior end subtruncate. Prodissoconch small, set off by raised rim, mucronate, pustulose, without radial ribs. Lamellae broad, esentelicon broad. Shell with approximately 15 broad radial ribs with

narrow interspaces. Radial ribs with cross-bars, most conspicuously ventrally. White to light brown. Right valve with large anterior cardinal and small, dorsally positioned posterior cardinal, the resilifer between them; without pit for posterior cardinal of left valve; anterior end with lateral on short submarginal ridge separated from hinge margin by groove for hinge margin of left valve; posterodorsal margin slightly pustulose, raised distally into small lateral tooth. Left valve with small, dorsally positioned anterior cardinal and large posterior cardinal, the resilifer between them; anterodorsal margin slightly pustulose, raised distally into low lateral tooth; posterior end with small lateral tooth on submarginal ridge, becoming more conspicuous in the largest specimens. Length to 1.9 mm (a paratype).

**Type Material:** LACM 2962, holotype, pair; length, 1.3 mm; height, 1.2 mm; LACM 2963, paratypes, 55 pairs, 97 valves, VELLERO III, Alan Hancock Foundation station BS 439, 24 January 1934; LACM 2964, paratype, right valve, length, 1.3 mm [LACM locality 34-256; Bahía Academy, Isla Santa Cruz, Islas Galápagos, Ecuador, 0.5° S, 15 m (Fig. 25), 1 closed pair and 5 additional valves specimens from this lot are contained in LACM 34-256.2].

**Type Locality:** Bahía Sullivan, Isla San Salvador, Islas Galápagos, Ecuador, 0°16' S, 90°34' W, Alan Hancock Foundation station BS 439, LACM locality 34-271, 37 m.

**Distribution:** Islas Galápagos, Ecuador from 0.2° S to 1.3° S, 16–124 m (mean = 51.4 m; n = 15).

**Other Material Examined:** Islas Galápagos, Ecuador: LACM 33-161.4, Bahía James, Isla San Salvador, 0.2° S, 27 m, 9 valves; LACM 34-273.5, same locality, 44 m, 2 valves; LACM 34-277.6, same locality, no depth recorded, 1 valve; LACM 34-259.5, same locality, 29 m, 3 pairs, 30 valves; Type locality, Bahía Sullivan, Isla San Salvador, 0.3° S, LACM locality 34-271, 37 m; LACM 33-174.10, Bahía Darwin, Isla Genovesa, 31 m, 2 valves; LACM 33-175.1, Isla Seymour, 0.4° S, 24 m, 2 pairs, 5 valves; LACM 34-265.1, Isla Seymour, 0.5° S, no depth recorded, 1 pair, 3 valves; LACM 34-292.3, Isla Seymour, 0.5° S, no depth recorded, 2 pairs, 5 valves; LACM 33-169.3, N of Isla Santa Cruz, 0.5° S, 124 m, 1 pair; LACM 33-170.6, same locality, 101 m, 1 valves; LACM 33-171.4, same locality, 64 m, 1 valve; LACM 33-172.3, same locality, 124 m, 3 valves; LACM 33-173.3, same locality, 101 m, 1 pair, 11 valves; LACM 33-166.5, N of Isla Pinzón, 0.6° S, 52 m, 2 valves; LACM 35-191.3, Bahía Cartago, Isla Isabella, 0.6° S, 22 m, 2 valves; LACM 34-256.2, Bahía Academy, Isla Santa Cruz, 0.5° S, 16 m, 1 pair, 5 valves, plus figured paratype; LACM 34-257.9, same locality, 27 m, 11 pairs, 26 valves, many juveniles; LACM 35-193.16, same locality, 15–37 m, 5 valves; LACM 34-270.6, Isla San Cristóbal, 0.5° S, no depth recorded, 7 valves; LACM 33-157.5, Bahía Post Office, Isla Santa María, 1.3° S, 16 m, 2 valves.

**Etymology:** This species is named for Daniel L. Geiger

er, a research associate of the Santa Barbara Museum of Natural History, who has been helpful on many projects.

**Discussion:** This species is closest to *Condylocardia digueti*, differing in having many more radial ribs and in being more ovate.

POSSIBLE ADDITIONAL SPECIES OF *CONDYLOCARDIA*

One lot contain specimens that do not fit the species described above, but there is too little material is available to propose an additional new taxon at this time: LACM 84-29.24, N side of Arch Rock, SE end of Isla Darwin, Islas Galápagos, Ecuador (1.6° N); 6–9 m. Lot contains 1 open pair and 2 valves, all somewhat worn. The shells are slightly longer and somewhat truncate anteriorly, with 12–13 elevated, nodose ribs.

*Carditella* E. A. Smith, 1881: 42–43.

**Type species:** (subsequent designation by Dall, 1903: 702): *C. pallida* E. A. Smith, 1881: 43, pl. 5, figure 9–9b. Recent, Estrecho de Magallanes, Chile. Medium sized to minute (up to 5.2 mm). With central resilifer as well as a sunken external ligament that is substantial in some species and minute in others. The following two species are placed in *Carditella* because of their small external ligaments in addition to a resilifer.

*Carditella galapagana* new species  
(Figures 29–32)

*Condylocardia* sp. 2.—Kaiser and Bryce, 2001: 15, pl. 7, figures 3, 3a, 3b.

**Description:** Shell trapezoidal, longer posteriorly; anterior end sharply rounded; posterior end subtruncate. Prodissoconch small, pointed, not strongly demarcated, pustulose, its tip rounded to flattened. Lunule narrow; esutcheon elongate, wider in right valve. Sculpture of 16–17 strong radial ribs; interspaces half as wide as ribs; radial ribs nodose, crossed by moderate commarginal ribs, forming nodes on rib surfaces. White. Right valve with broad anterior cardinal; resilifer separated from sunken external ligament by low ridge that is slightly swollen dorsally into minute tooth; anterior end with triangular lateral tooth on submarginal ridge, separated from shell margin by groove for margin of left valve; anterior valve margin between beaks and distal lateral tooth granular. Left valve with large anterior cardinal, which fits above anterior cardinal of right valve, and narrow ridge on anterior border of resilifer; resilifer separated from sunken external ligament by low ridge, swollen dorsally into minute tooth; anterior lateral on hinge margin, the area between it and beaks granular; posterodorsal margin with lateral on submarginal ridge separated by serrate groove for margin of right valve. Length to 2.6 mm (a paratype valve).

**Type Material:** LACM 2930, holotype, pair; length,

1.9 mm; height, 1.7 mm. LACM 2931, paratypes, 3 pairs, approximately 108 valves; AM C.403175, paratypes, 1 right valve, 1 left valve; all VILERO III, Alan Hancock Foundation station BS 430, 11 January 1934, from type locality. Two paratypes are figured here (Figures 28–31).

**Type Locality:** Isla Wolf, Islas Galápagos, Ecuador, 1°23' N, 91°49' W, Alan Hancock Foundation station BS 430; LACM locality 31-264, 183–274 m, mud. This is the same station as the type locality of *Condylocardia koolsae*.

**Distribution:** Isla de Malpelo, Colombia, 4.0° N, to Islas Galápagos, Ecuador, as far south as 0.5° S; approximately 29–228 m (mean = 151 m; n = 4).

**Other Material Examined:** Kaiser Collection, "Tiger Mount", Isla de Malpelo, Colombia, 4.0° N; 24–34 m, 1 valves. Material from the Islas Galápagos, Ecuador: LACM 34-263.6, Isla Wolf, 1.4° N, 183 m, 2 valves; Type locality, Isla Wolf, 1.4° N, LACM locality 34-264, 183–274 m; LACM 34-265.13, Tagus Cove, Isla Isabela, 0.3° S, 146–183 m, 5 pairs, 90 valves; LACM 34-270.5, Isla San Cristóbal, 0.5° S, no depth recorded, three tiny valves [specimens tentatively assigned to this species].

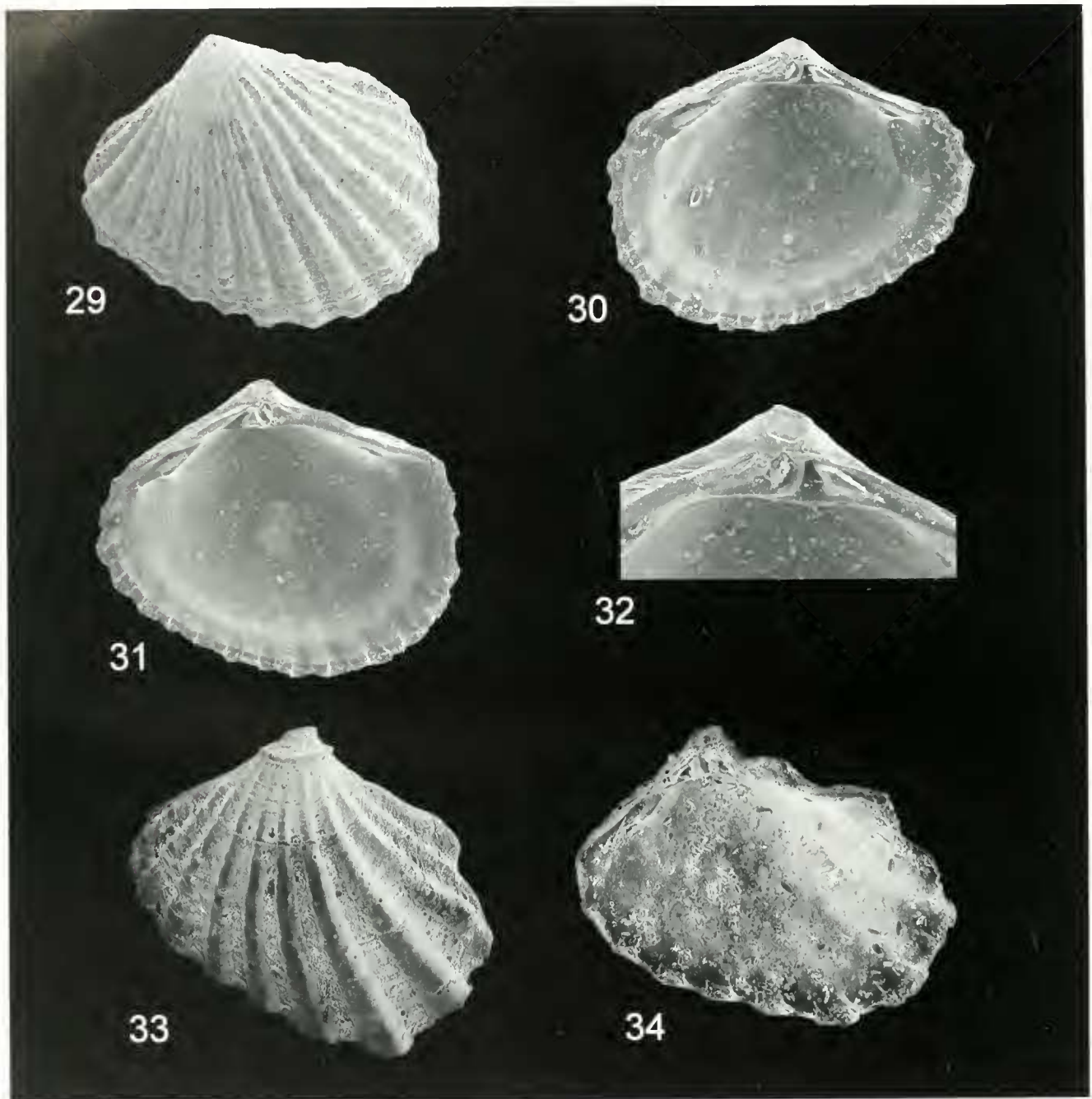
**Etymology:** The specific name refers to the Islas Galápagos, Ecuador.

**Discussion:** This species is somewhat similar to but has more radial ribs than *C. hawaiiensis* Dall, Bartsch and Rehder, 1938 (p. 120, pl. 33, figures 5–8), which has only about 11 (Kay, 1979: 553, figure 180E, 554). It differs from the Peruvian-Chilean *Carditella tegulata* (see list below) in being more quadrate and in having more radial ribs; *C. tegulata* has only 10–12 ribs. The four worn valves from Isla de Malpelo are a little more elliptical and elongate than the material from the Islas Galápagos and might come to be regarded as another species when more material becomes available.

*Carditella marieta* new species  
(Figures 33, 34)

**Description:** Shell trapezoidal, longer posteriorly; anterior end sharply rounded; posterior end broad, flared. Prodissoconch small, set off by raised rim, with fine radial sculpture and flattened tip. Lunule and esutcheon narrow. Sculpture of 11–13 strong radial ribs, largest and with wider interspaces posteriorly; radial ribs with scattered nodes. Surface with few brown flecks on white background, especially on posterior slope. Right valve with broad anterior cardinal; resilifer separated from sunken external ligament by low ridge that is swollen dorsally into minute tooth; anterior end with triangular lateral tooth on submarginal ridge, separated from shell margin by groove for margin of left valve; posterior valve margin raised distally into lateral tooth. Left valve with narrow anterior cardinal, which fits above anterior cardinal of right valve; narrow ridge defines anterior border





Figures 29–34. *Carditella* species. 29–32, *Carditella galapagana* new species, paratypes, external view of left valve, internal views of left and right valves, close-up view of hinge of left valve, Isla Wolf, Islas Galápagos, Ecuador, 274 m, LACM 2931, locality 34-264, lengths = 2.1 mm (external view), 2.1 mm (internal views). 33, 34, *Carditella marieta* new species, holotype, external view of left valve and internal view of right valve, Islas Marietas, Nayarit, Mexico, CAS 159057, length = 1.6 mm.

of resilifer; resilifer separated from sunken external ligament by low ridge; anterior lateral on hinge margin; posterior end with lateral on submarginal ridge separated from shell margin by groove for margin of right valve. Length to 2.0 mm (Isla San Juanito; Kaiser Collection).

**Type Material:** CAS 159057, holotype, pair; length, 1.6 mm, height 1.2 mm. Figures 33, 31; CAS 12313,

paratypes, 1 broken right valve, 9 closed pairs, mostly small; all formerly Stanford University 52426, Dwyer Expedition, 1965, from type locality, "diving".

**Type Locality:** Islas Marietas, Bahía de Banderas, Nayarit, Mexico, 20.7° N.

**Distribution:** Islas Tres Marias, Nayarit, 21.7° N, to

Islas Revillagigedos, Mexico, 18.3° N; approximately 7–46 m (mean = 20.7 m;  $n = 7$ ).

**Other Material Examined:** Mexico: Kaiser Collection, Roca Blanca, Isla San Juanito, Islas Tres Marías, Nayarit, 21.7° N, 8–11 m, 6 pairs; Kaiser Collection, Isla María Magdalena, Islas Tres Marías, Nayarit, 21.5° N, 15–23 m, 1 closed pair; CAS 42335, Isla María Magdalena, Islas Tres Marías, Nayarit, 21.5° N, depth not recorded, 1 closed pair; LACM 65-12.41, E anchorage, Isla María Cleofas, Islas Tres Marías, Nayarit, 21.4° N, 5–9 m, 15 pairs, all but one tightly sealed; Kaiser Collection, Isla María Cleofas, Islas Tres Marías, Nayarit, 21.3° N, 16–23 m, 6 sealed pairs; Kaiser Collection, S side, Isla Grande, Islas Marietas, Bahía de Banderas, 20.7° N, 27–40 m, 2 small pairs; CAS 42343, type lot, Islas Marietas, Bahía de Banderas, Nayarit, 20.7° N, “diving”; Kaiser Collection, Majalunitas, Bahía de Banderas, Nayarit, 20.5° N, 6–15 m, 1 small pair; LACM 34-260.6, Bahía Sulphur, Isla Clarion, Islas Revillagigedos, 18.3° N, 46 m, 1 valve.

**Etymology:** The specific name is derived from the Islas Marietas, the type locality.

**Discussion:** This species differs from *Carditella galapagana* in that it has a much longer posterior end and fewer ribs, and it is somewhat smaller. This species is similar in shape to *Condylocardia kaiserae* except that, unlike the latter, it has a small sunken external ligament. It is also similar in shape to some juvenile carditids, such as *Cardites laticostata* (G. B. Sowerby I, in Broderip and G. B. Sowerby I, 1833: 195), but can be distinguished by its central resifier, its larger prodissoconch with a raised rim and radial sculpture, and its wider, less scabrose ribs.

#### NOTES ON THE SOUTHERN SOUTH AMERICAN SPECIES OF CARDITELLA

There are at least five poorly known species of *Carditella* that occur on the southern coast of South America:

*Carditella exalata* E. A. Smith, 1855 (215, pl. 15, figure 6, 6a), Estrecho de Magallanes, Chile; also Tristan da Cunha and Falkland Islands, South Atlantic Ocean. This species is longer posteriorly and is most similar to *C. naviformis*. It has 14 ribs and attains 4 mm in length. See also Dell (1964: 193, 188, figure 3.6).

*Carditella naviformis* (Reeve, 1843) (pl. 9, figure 45, 1844: 194, as *Cardita*), Arica, Tarapacá Province, to the Estrecho de Magallanes, Chile. This species is longer posteriorly, has 9–10 ribs, and attains 4 mm in length. See also Dell (1964: 194, 188, figure 3.1).

*Carditella pallida* E. A. Smith, 1851 (p. 43, pl. 5, figures 9–9b), Estrecho de Magallanes, Chile. The type species of the genus, it is approximately equilateral, has 14–15 ribs, and attains 5.2 mm in length.

*Carditella semen* (Reeve, 1843) (pl. 9, figure 43, 1844: 193–194, as *Cardita*) [possible synonyms: *Cardita australis* Philippi, 1855: 23–24, non *Venericardia australis* Lamarck, 1818: 610, *Actinobolus philippi* Tryon, 1872: 254, non nov. pro “*Cardita australis* Philippi (not Quoy”

*Cardium parvulum* Dunker, 1861: 36–37, non Donovan, 1800: pl. 32, figure 3], Pisco, Ica Department, Perú, to Arica, Tarapacá Province, Chile. This species is oval, longer posteriorly, has 14–15 ribs, and attains 3 mm in length. *Carditella tegulata* (Reeve, 1843) (pl. 9, figure 48, 1844: 194, as *Cardita*) [possible synonym: *Cardium pygmaeum* Philippi, 1860: 176, pl. 7, figure 3a–c, misspelled as “*C. pygmae*” by Bernard, 1953: 34] Islas Lobos de Afuera, Lambayeque Province, Perú (6.9° S) (LACM 35-111.4), to the Estrecho de Magallanes, Chile. Larger specimens are longer posteriorly, have 10–12 ribs, and attain about 4 mm in length. Reeve figured such a specimen, whereas Dell (1964: 194, 188, figure 3.8) illustrated a syntype that is almost equilateral, presumably a smaller specimen. See also Marinovich (1973: 10, figure 9) and Reid and Osorio (2000: 136–139, fig. 7K).

*Cardita patchiana* Clessin, 1855 (p. 20, pl. 6, figures 7–8) described from Iquique, Chile, was synonymized by F. R. Bernard (1953: 34) with *Carditella naviformis* (Reeve, 1843). However, its original measurement (14 mm) is too large to make this plausible, and it might instead be a small specimen of *Cylocardia spurca* (G. B. Sowerby I, in Broderip and G. B. Sowerby I, 1833: 195, as *Cardita*), described from the same locality and which Clessin's figure more closely resembles.

#### DISCUSSION

According to Middellart (personal communication, December 2002), who has studied the extensive Australian fauna of condylocardiids, only *Condylocardia elongata*, *C. kaiserae*, and *C. koolsae* match the hinge morphology of the type species of *Condylocardia*, whereas the others are closer to the hinge morphology of *Condylocuma*, though differing in sculpture and prodissoconch shape. Moreover, *Condylocardia kaiserae*, with its very long posterior end, is unlike other species of the genus. Eventually, specialists in this group may wish to propose additional generic taxa to accommodate some of these species.

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